Docket No.:
65948/P063US/10315929
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Letters Patent of:
Ravi Narasimhan et al.

Patent No.: 7,016,649 — Confirmation No.: 9004

Issued: March 21, 2006 — Art Unit: 2681

For: SPACE-TIME AND SPACE-FREQUENCY HOPPING FOR CAPACITY ENHANCEMENT OF MOBILE DATA SYSTEMS — Examiner: Jean Alland Gelin

REQUEST FOR CERTIFICATE OF CORRECTION
PURSUANT TO 37 CFR 1.322

Attention: Certificate of Correction Branch
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Upon reviewing the above-identified patent, Patentee noted a typographical error which should be corrected.

On the Cover Page:

On the cover page, located in the Related U.S. Application Data (left hand column), delete the portion of text reading "Provisional application No. 60/190,009, filed on Mar. 17, 2000." and replace with --Provisional application No. 60/234,722, filed on Sept. 22, 2000, and provisional application No. 60/190,009, filed on Mar. 17, 2000, to which the benefit of priority is claimed.--.

This error was not in the application as filed by applicant, rather, incorrectly transcribed to the Letters Patent; accordingly no fee is required. The Preliminary Amendment filed September 7, 2001 that claims priority is attached for your convenience. Therefore, transmitted herewith is a proposed Certificate of Correction effecting such

amendment. This error now sought to be corrected is an inadvertent typographical error the correction of which does not involve new matter or require reexamination. Patentee respectfully solicits the granting of the requested Certificate of Correction.

Applicant believes no fee is due with this request. However, if a fee is due, please charge our Deposit Account No. 06-2380, under Order No. 65948/P063US/10315929 from which the undersigned is authorized to draw.

Dated: June 19, 2008

Respectfully submitted,

By _____

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PTO/SB/44 (09-07)
Approved for use through 08/31/2010. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO.	:	7,016,649
APPLICATION NO.	:	09/803,718
ISSUE DATE	:	March 21, 2006
INVENTOR(S)	:	Ravi Narasimhan et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Cover Page:

On the cover page, located in the Related U.S. Application Data (left hand column), delete the portion of text reading "Provisional application No. 60/190,009, filed on Mar. 17, 2000." and replace with --Provisional application No. 60/234,722, filed on Sept. 22, 2000, and provisional application No. 60/190,009, filed on Mar. 17, 2000, to which the benefit of priority is claimed.--.

55245978.1

MAILING ADDRESS OF SENDER (Please do not use customer number below):
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I hereby certify that this correspondence is b[redacted]eposited with the U.S. Postal Service with sufficient postage as Firs[redacted]s Mail, in an envelope addressed to: Box Non-Fee Amendment, Commissioner for Patents, Washington, DC 20231, on the date shown below.

Dated: September 7, 2001 Signature: Rita Carr

Rita Carr

Docket No.: 47586/P063US/10026081
(PATENT)

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SEP 10 2001
PATENT & TRADEMARK OFFICE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Ravi Narasimhan, et al.

Application No.: 09/803,718 Group Art Unit: 2631

Filed: March 9, 2001 Examiner: Not Yet Assigned

For: SPACE-TIME AND SPACE-FREQUENCY HOPPING FOR CAPACITY ENHANCEMENT OF MOBILE DATA SYSTEMS

RECEIVED
SEP 1[redacted]
Technology Center

FIRST PRELIMINARY AMENDMENT

Box Non-Fee Amendment
Commissioner for Patents
Washington, DC 20231

Dear Sir:

In furtherance to the filing of the present application on March 9, 2001 and before substantive examination thereof, please amend the above-identified U.S. Patent application as follows:

In the Specification

As provided for under 37 C.F.R. § 1.121(b), a clean version of a replacement paragraph is provided below. Attached hereto in the paper captioned "Version With Markings to Show Changes Made" is a marked-up version of the changes made to the paragraph by the current amendment.

Please replace the first paragraph appearing at page 1 under the heading "Related Applications" with the following:

The present application is related to co-pending United States provisional patent application serial number 60/190,009 entitled "Space-Time and Space-Frequency Hopping for Capacity Enhancement of Mobile Data Systems," filed March 17, 2000, to which the benefit of priority of filing is hereby claimed and the disclosure of which is hereby

incorporated herein by reference, and the present application is also related to co-pending United States provisional patent application serial number 60/234,722 entitled "Space-Time Hopping for Capacity Enhancement of Mobile Data Systems," filed September 22, 2000, to which the benefit of priority of filing is hereby claimed.

In the Claims

As provided for under 37 C.F.R. §1.121(c), a clean version of the entire set of pending claims, whether amended or unchanged, is provided below for the convenience of the Examiner. Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with markings to show changes made." Please amend claims 57 and 59-61 as follows:

1. A system for providing communications with a plurality of subscriber units comprising:

beam forming circuitry;

direction finding circuitry; and

control circuitry, wherein said control circuitry operates with said direction finding circuitry to determine a combination of subscriber units of said plurality of subscriber units for providing substantially isolated communication links, and wherein said control circuitry operates with said beam forming circuitry to implement an interference diversity gain scheme for use in conducting communications through said substantially isolated communication links.

2. The system of claim 1, wherein said control circuitry operates to determine a data rate for providing desired communication quality with subscriber units of said combination of subscriber units achievable when said interference diversity gain scheme is implemented.

3. The system of claim 1, wherein operation of said control circuitry with said direction finding circuitry determines angular separation of subscriber units of said plurality of subscriber units.

4. The system of claim 3, wherein said combination of subscriber units comprises a combination of subscriber units in which each subscriber unit of the combination has a minimum angular separation with respect to other subscriber units of the combination.

5. The system of claim 1, wherein operation of said control circuitry with said direction finding circuitry determines a pilot C/I of subscriber units of said plurality of subscriber units.

6. The system of claim 5, wherein said combination of subscriber units comprises a combination of subscriber units which as a combination have a greatest sum of pilot C/I as compared to other combinations of subscriber units of said plurality of subscriber units.

7. The system of claim 1, wherein said interference diversity gain scheme is implemented to alter a communication attribute at a rate higher than a base station interleaving frame rate.

8. The system of claim 7, wherein said rate is several times the base station interleaving frame rate.

9. The system of claim 1, wherein said interference diversity gain scheme is implemented to alter a communication attribute at a rate lower than a base station interleaving frame rate.

10. The system of claim 9, wherein said rate is on the order of tenths of the interleaving frame rate.

11. The system of claim 1, wherein said implementing an interference diversity gain scheme comprises a communication attribute hopping scheme to periodically alter an attribute of said communication links.

12. The system of claim 11, wherein the communication attribute hopping scheme comprises a pseudo random hopping scheme.

13. The system of claim 11, wherein the communication attribute hopping scheme comprises a deterministic hopping scheme.

14. The system of claim 11, wherein a communication attribute altered by the communication attribute hopping scheme comprises a time slot.

15. The system of claim 11, wherein a communication attribute altered by the communication attribute hopping scheme comprises a carrier frequency.

16. The system of claim 11, wherein a communication attribute altered by the communication attribute hopping scheme comprises an antenna beam spatial characteristic.

17. The system of claim 11, wherein the communication attribute hopping scheme alters a plurality of communication attributes.

18. The system of claim 17, wherein said plurality of communication attributes comprises a time slot and a carrier frequency.

19. The system of claim 1, wherein said beam forming circuitry comprises adaptive beam forming circuitry.

20. The system of claim 1, wherein said beam forming circuitry comprises fixed beam forming circuitry.

21. A method for providing communication comprising:

implementing an interference diversity gain scheme for conducting communications between a plurality of subscriber units and a base station;

determining a combination of subscriber units of said plurality of subscriber units for providing simultaneous substantially isolated communication links between subscriber units of said combination of subscriber units and said base station;

determining a data rate for providing desired communication quality with subscriber units of said combination of subscriber units achievable when said interference diversity gain scheme is implemented; and

providing said simultaneous substantially isolated communication links between subscriber units of said combination of subscriber units and said base station and providing therein data communication at an associated one of said determined data rates.

22. The method of claim 21, wherein said determining a combination of subscriber units comprises:

determining a combination of subscriber units in which each subscriber unit of the combination has a minimum angular separation with respect to other subscriber units of the combination.

23. The method of claim 21, wherein said determining a combination of subscriber units comprises:

determining a combination of subscriber units which as a combination have a greatest sum of pilot C/I as compared to other combinations of subscriber units of said plurality of subscriber units.

24. The method of claim 21, wherein said interference diversity gain scheme is implemented to alter a communication attribute at a rate higher than a base station interleaving frame rate.

25. The method of claim 24, wherein said rate is several times the base station interleaving frame rate.

26. The method of claim 21, wherein said interference diversity gain scheme is implemented to alter a communication attribute at a rate lower than a base station interleaving frame rate.

27. The method of claim 26, wherein said rate is on the order of tenths of the interleaving frame rate.

28. The method of claim 21, wherein said implementing an interference diversity gain scheme comprises:

establishing a communication attribute hopping scheme to periodically alter an attribute of said communication links.

29. The method of claim 28, wherein the communication attribute hopping scheme comprises a pseudo random hopping scheme.

30. The method of claim 28, wherein the communication attribute hopping scheme comprises a deterministic hopping scheme.

31. The method of claim 28, wherein a communication attribute altered by the communication attribute hopping scheme comprises a time slot.

32. The method of claim 28, wherein a communication attribute altered by the communication attribute hopping scheme comprises a carrier frequency.

33. The method of claim 28, wherein a communication attribute altered by the communication attribute hopping scheme comprises an antenna beam spatial characteristic.

34. The method of claim 28, wherein the communication attribute hopping scheme alters a plurality of communication attributes.

35. The method of claim 34, wherein said plurality of communication attributes comprises a time slot and a carrier frequency.

36. The method of claim 21, wherein said communication links are provided using a multiple beam antenna array.

37. The method of claim 36, wherein said multiple beam antenna array is coupled to adaptive beam forming circuitry.

38. The method of claim 36, wherein said multiple beam antenna array is coupled to fixed beam forming circuitry.

39. A method for providing increased wireless communication capacity comprising:

establishing a communication attribute hopping scheme to alter, over time, an attribute of a communication link associated with each active subscriber unit of a plurality of subscriber units in communication with a base station;

determining a combination of subscriber units of said plurality of subscriber units in which each subscriber unit of the combination has a minimum angular separation with respect to other subscriber units of the combination for providing substantially isolated communication links between subscriber units of said combination of subscriber units and said base station;

determining a data rate achievable when said communication attribute hopping scheme is implemented for providing desired communication quality with subscriber units of said combination of subscriber units;

providing said substantially isolated communication links between subscriber units of said combination of subscriber units and said base station and providing therein data communication at an associated one of said determined data rates; and

applying said communication attribute hopping scheme to said substantially isolated communication links.

40. The method of claim 39, wherein the communication attribute hopping scheme comprises a pseudo random hopping scheme.

41. The method of claim 39, wherein the communication attribute hopping scheme comprises a deterministic hopping scheme.

42. The method of claim 39, wherein a communication attribute altered by the communication attribute hopping scheme comprises a time slot.

43. The method of claim 39, wherein a communication attribute altered by the communication attribute hopping scheme comprises a carrier frequency.

44. The method of claim 39, wherein a communication attribute altered by the communication attribute hopping scheme comprises an antenna beam spatial characteristic.

45. The method of claim 39, wherein the communication attribute hopping scheme alters a plurality of communication attributes.

46. The method of claim 45, wherein said plurality of communication attributes comprises a time slot and a carrier frequency.

47. The method of claim 39, wherein said determining a combination of subscriber units comprises:

determining all combinations of subscriber units having at least a threshold angular separation and selecting a best combination of subscriber units therefrom.

48. The method of claim 47, wherein said determining a combination of subscriber units further comprises:

selecting said best combination of subscriber units at least in part as a combination having a greatest sum of pilot C/I.

49. The method of claim 39, wherein said communication links are provided using a multiple beam antenna array.

50. The method of claim 49, wherein said multiple beam antenna array is coupled to adaptive beam forming circuitry.

51. The method of claim 49, wherein said multiple beam antenna array is coupled to fixed beam forming circuitry.

52. The method of claim 39, wherein said substantially isolated communication links between subscriber units of said combination of subscriber units and said base station are provided simultaneously.

53. A method for mobile data communication comprising;

transmitting from a base station to mobile stations in a time division access scheme using multiple beams; and

switching, over time, a forward link time slot assignment of said time division access scheme of each of a plurality of subscriber units.

54. The method of claim 53, wherein said switching a forward link time slot assignment comprises:

transmitting to said plurality of subscriber units each within a different time slot of said time division access scheme; and

varying from transmission frame to transmission frame in a pseudo random sequence the time slot within which transmission is made to said subscribers.

55. The method of claim 53, further comprising

varying the carrier frequency from transmission frame to transmission frame.

56. The method of claim 53, wherein the forward link time slot assignment is switched at a rate several times an interleaving frame rate.

A2

57. (Amended) The method of claim 56, wherein a forward link data rate for each subscriber unit is determined from a pilot signal-to-interference ratio, an antenna array gain, and an interference diversity gain estimated from statistics of an interference environment.

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58. The method of claim 56 wherein one or more simultaneous forward link beams are formed to maximize throughput for a fixed transmit power.

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59. (Amended) The method of claim 53, wherein the forward link time slot assignment is switched at a rate less than an interleaving frame rate.

A3

60. (Amended) The method of claim 59, wherein a forward link data rate is determined for each subscriber unit by monitoring signal quality of a traffic signal-to-interference ratio.

61. (Amended) The method of claim 59_2 wherein a number of simultaneous forward link beams is maximized at each switching interval to maximize throughput for a fixed transmit power.

REMARKS

Applicants have amended the specification to claim priority to a co-pending and commonly assigned United States provisional patent application as provided for under 37 C.F.R. § 1.78(a)(2). No new matter has been added.

Applicants have amended the claims to correct informalities discovered during the preparation of this amendment. Specifically, claims 57 and 59-61 have been amended to present proper antecedent basis for the claim language therein as well as to correct typographical errors. No new matter has been added.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**Version with markings to show changes made.**"

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 06-2380, under Order No. DO-047586/P063US/10026081 from which the undersigned is authorized to draw.

Dated: September 7, 2001

Respectfully submitted,

By _____

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Attorneys for Applicant

Version With Markings to Show Changes Made

The paragraph at page 1 following the heading "Related Applications" has been amended as follows:

The present application is related to co-pending United States provisional patent application serial number 60/190,009 entitled "Space-Time and Space-Frequency Hopping for Capacity Enhancement of Mobile Data Systems," filed March 17, 2000, to which the benefit of priority of filing is hereby claimed and the disclosure of which is hereby incorporated herein by reference, and the present application is also related to co-pending United States provisional patent application serial number 60/234,722 entitled "Space-Time Hopping for Capacity Enhancement of Mobile Data Systems," filed September 22, 2000, to which the benefit of priority of filing is hereby claimed.

The claims have been amended as follows:

57. (Amended) The method [for] of claim 56, wherein a forward link data rate for each subscriber unit is determined from [the] a pilot signal-to-interference ratio, [the] an antenna array gain, and [the] an interference diversity gain estimated from [the] statistics of [the] an interference environment.

59. (Amended) The method of claim 53, [in which for] wherein the forward link time slot assignment is switched at a rate less than an interleaving frame rate.

60. (Amended) The method [for] of claim 59, wherein a forward link data rate is determined for each subscriber unit by monitoring [the] signal quality of [the] a traffic signal-to-interference ratio.

61. (Amended) The method of claim 59, [in which the] wherein a number of simultaneous forward link beams is maximized at each switching interval to maximize throughput for a fixed transmit power.